

General Certificate of Education
January 2008
Advanced Subsidiary Examination



STATISTICS
Unit Statistics 3

SS03

Tuesday 15 January 2008 9.00 am to 10.30 am

For this paper you must have:

- an 8-page answer book
 - the blue AQA booklet of formulae and statistical tables.
- You may use a graphics calculator.

Time allowed: 1 hour 30 minutes

Instructions

- Use blue or black ink or ball-point pen. Pencil should only be used for drawing.
- Write the information required on the front of your answer book. The *Examining Body* for this paper is AQA. The *Paper Reference* is SS03.
- Answer **all** questions.
- Show all necessary working; otherwise marks for method may be lost.
- The **final** answer to questions requiring the use of tables or calculators should normally be given to three significant figures.

Information

- The maximum mark for this paper is 75.
- The marks for questions are shown in brackets.

Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.

Answer **all** questions.

- 1 During 2005, the weekly amounts of pocket money given to a random sample of 14-year-old children living in Brighton were:

£ 5.50 £6.30 £7.50 £15.00 £10.00 £12.50
 £12.00 £6.00 £7.75 £10.50 £ 5.00 £ 7.15

During 2003, the median weekly amount of pocket money given to 14-year-old children living in Brighton was £5.60.

Carry out a sign test to determine whether there is support for the claim that the median weekly amount of pocket money given to 14-year-old children living in Brighton has changed since 2003. Use the 10% level of significance. (7 marks)

- 2 As part of a Psychology research project, a student carried out a personality test on eight golfers and seven rugby players.

All players involved in the project were selected at random.

The scores achieved are given in the table, with a higher score indicating a more outgoing personality.

Golfers	10	11	12	14	17	18	20	21
Rugby players	13	16	17	19	22	23	24	

Carry out a distribution-free test, at the 5% level of significance, to investigate whether rugby players have more outgoing personalities than golfers.

Interpret your conclusion in context.

(10 marks)

3 The USA collects information on many types of criminal offence.

- (a) For crimes against property, the type of victim and the type of offence involved are recorded. The details for a random sample of 526 such crimes which occurred during 2004 are summarised in **Table 1**.

Table 1

Type of victim \ Type of offence	Individual	Business
Robbery	112	108
Burglary	146	96
Arson	44	20

Test, at the 5% level of significance, whether the type of victim is independent of the type of offence.

Interpret your conclusion in context.

(10 marks)

- (b) For crimes against people, the age of the offender and the type of offence are recorded. Information collected for one city in the USA for a random sample of 88 crimes committed during 2004 is summarised in **Table 2**.

Table 2

Age of offender \ Type of offence	Under 25 years	25 years and over
Aggravated assault	5	4
Simple assault	12	19
Intimidation	16	32

A test for association is to be carried out on the data given in **Table 2**.

- (i) Calculate the expected values for the contingency table. *(3 marks)*
- (ii) Give a reason why it is necessary to pool two categories. *(1 mark)*
- (iii) Give a reason for your choice of categories to pool. *(1 mark)*
- (iv) Using the 5% significance level, examine whether the age of the offender is associated with the type of offence. *(7 marks)*

Turn over ►

- 4 National statistics on teenage conceptions were obtained for 1999 and 2003. The conception rates per 1000 teenagers for a random sample of 10 regions in England and Wales are given in the table.

Region	A	B	C	D	E	F	G	H	I	J
1999	51.1	55.3	48.8	51.0	43.5	49.3	36.4	50.5	35.9	34.1
2003	45.7	52.1	45.0	46.8	41.1	47.2	33.3	50.8	33.1	37.5

- (a) Carry out a Wilcoxon signed-rank test, at the 5% significance level, to investigate whether the average teenage conception rate decreased between 1999 and 2003.

Interpret your conclusion in context.

(9 marks)

- (b) Explain the advantages of using a matched-pairs design for a test such as the one carried out in part (a).

(2 marks)

- (c) Explain, in the context of this question, the meaning of a Type I error.

(2 marks)

- 5 The gate receipts, x , and the player costs, y , during 1990 for a random sample of eleven US baseball teams are given in the table.

All values for x and y are given in millions of US dollars.

Team	x	y
A	25.3	22.7
B	25.2	22.2
C	24.6	22.3
D	22.5	20.4
E	20.8	19.6
F	19.7	13.8
G	19.0	22.5
H	18.1	8.1
I	16.0	14.2
J	16.0	23.6
K	11.1	16.8

- (a) Calculate the value of Spearman's rank correlation coefficient between x and y .
(6 marks)
- (b) Carry out a hypothesis test, at the 10% level of significance, to determine whether the value that you calculated in part (a) indicates a positive association between x and y .

Interpret your conclusion in context. (5 marks)

Turn over for the next question

Turn over ►

- 6 A study was carried out to assess the ability of recall tests to distinguish between adults with normal memory function, with depression or with mild Alzheimer's disease.

Nineteen adults participated in a recall test, where the maximum possible score was 60.

The results are given in the table.

Normal memory function	Depression	Mild Alzheimer's disease
29	24	10
42	30	17
46	31	20
47	33	22
50	39	25
52	40	28
55		

Carry out a Kruskal-Wallis test, using the 1% significance level, to investigate whether there is any difference in average score for adults with normal memory function, with depression or with mild Alzheimer's disease. (12 marks)

END OF QUESTIONS

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